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Legacy Management Requires Information

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

FLUOR.

***P.O. Box 1000
Richland, Washington***

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LEGACY MANAGEMENT REQUIRES INFORMATION

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ABSTRACT

Legacy Management Requires Information describes the goal(s) of the U.S. Department of Energy's Office of Legacy Management (LM) relative to maintaining critical records and the way those goals are being addressed at Hanford. The paper discusses the current practices for document control, as well as the use of modern databases for both storing and accessing the data to support cleanup decisions.

In addition to the information goals of LM, the Hanford Federal Facility Agreement and Consent Order, known as the "Tri-Party Agreement" (TPA) is one of the main drivers in documentation and data management. The TPA, which specifies discrete milestones for cleaning up the Hanford Site, is a legally binding agreement among the U.S. Department of Energy (DOE), the Washington State Department of Ecology (Ecology), and the U.S. Environmental Protection Agency (EPA). The TPA requires that DOE provide the lead regulatory agency with the results of analytical laboratory and non-laboratory tests/readings to help guide them in making decisions. The Agreement also calls for each signatory to preserve – for at least ten years after the Agreement has ended – all of the records in its or its contractors, possession related to sampling, analysis, investigations, and monitoring conducted. The tools used at Hanford to meet TPA requirements are also the tools that can satisfy the needs of LM.

INTRODUCTION

The October 2006 draft Strategic Plan for the Office of Legacy Management lists five goals: the second goal is "preserve and protect legacy records and information." As stated in the draft plan, "This goal recognizes LM's commitment to successfully manage records, information, and archives of legacy sites under its authority." Preserving and protecting records and information, however, must start well before a site is turned over to LM. It must start with the records from site operations and continue through the cleanup process. Policies, procedures, and practices for information management must be in place from the start of operations. Unfortunately, the United States was in a war at the start of operations of the weapons-production sites and many of the techniques that were developed and processes followed were first-of-kind. Much of the history of Hanford is sparse. However, what is left from that valiant period must be preserved to help current and future generations understand, appreciate, and document Hanford's history.

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Established in the 1940s to produce material for nuclear weapons as part of the Manhattan Project, Hanford is often referred to as the world's largest environmental cleanup project. The Site covers more than 580 square miles in a relatively remote region of southeastern Washington state in the U.S. The production of nuclear materials at Hanford has left a legacy of tremendous proportions in terms of hazardous and radioactive waste. From a waste-management point of view, the task is enormous: 1,700 waste sites; 500 contaminated buildings; 450 billion gallons of liquid waste; 270 billion gallons of contaminated groundwater that exceeds drinking-water standards; 53 million gallons of highly radioactive liquid waste stored in 177 underground tanks; 9 reactors; 5 million cubic yards of contaminated soil; 22 thousand drums of mixed waste; 2,300 tons of spent nuclear fuel; and 17.8 metric tons of plutonium-bearing material...for just a partial listing. As far as infrastructure that supports the site, the numbers are almost as staggering: 500 miles of roads, four fire stations, 200 buildings with 5 million square feet of floor space, 104 miles of water lines, and 200 miles of electric lines.

Hanford Site Setting

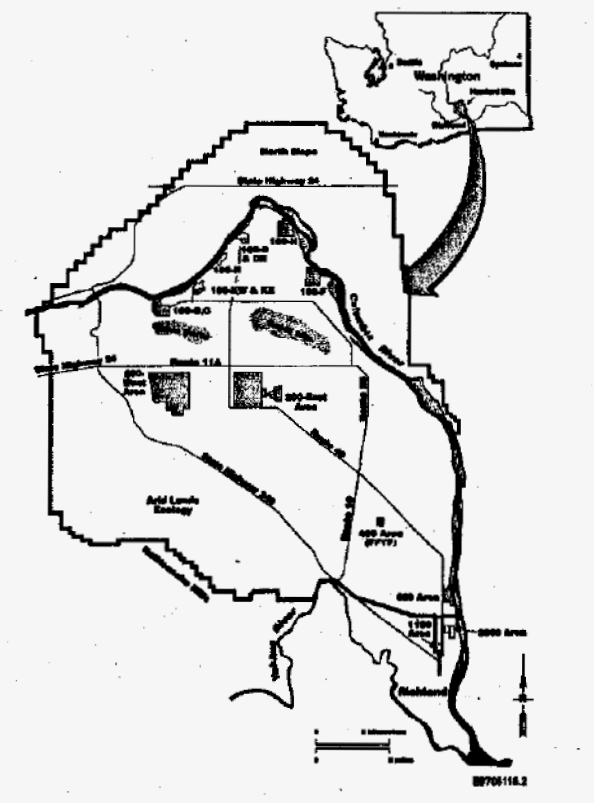


Fig. 1. Hanford is a 586-square-mile reservation next to the Columbia River in southeastern Washington State.

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OPERATIONAL OVERVIEW OF THE HANFORD SITE

In 1943, under the auspices of the Manhattan Project, the U.S. Army Corps of Engineers selected Hanford to site nuclear reactors and spent-fuel-processing facilities (Figure 1). Hanford's mission was to produce plutonium for national defense. This objective required a large military-industrial complex that included multiple facilities: fuel manufacturing, nuclear reactors, chemical processing, waste management, and research.

By 1944, the first two of nine production reactors were constructed, located in the Site's 100 Area, and began irradiating uranium to produce plutonium. These reactors irradiated approximately 100,000 metric tons of uranium fuel. Eight of the reactors, which ran until 1971, were graphite-moderated and used water from the Columbia River for once-through cooling. The ninth reactor, a dual-purpose unit (N Reactor), used recirculating water coolant and produced plutonium for defense applications, as well as steam for electricity. N Reactor, now deactivated, operated until 1987.

Two test reactors and one commercial unit were also constructed and operated at the Hanford Site: the Plutonium Recycle Test Reactor (PRTR), the Fast Flux Test Facility (FFTF), and a unit owned and operated by Washington Public Power Supply System, respectively. The PRTR was a heavy-water-moderated test reactor located in the 300 Area. The PRTR has been deactivated. FFTF, a sodium-cooled reactor located in the 400 Area, was used to test fuel and material for advanced commercial nuclear power plants. In 1993, FFTF began transitioning towards permanent shutdown. The commercial nuclear power plant, WNP-2, is a boiling water reactor that is still operating today.

Chemical-processing operations during nuclear production generated highly radioactive liquid wastes. About 245 million liters (65 million gallons) of high-level waste are stored at the Hanford Site in 177 large single- and double-shelled underground tanks. The tanks, divided into 18 groups (or "farms"), are located in the 200 Area. Of the original 149 single-shell tanks, 67 have leaked, or are assumed to have leaked, about 3.8 million liters (1 million gallons) of contaminated liquid to the soil column – recent estimates push the number even higher. The 28 double shell tanks built since 1968 have a tank-within-a-tank design for better containment and have not leaked.

The solid waste generated from past operations consists of low-level radioactive waste, low-level mixed waste, transuranic waste, and hazardous chemical waste. The current inventory of solid waste buried or stored in underground trenches and above-ground facilities is about 87,000 cubic meters (114,000 cubic yards) in the 100 Area; 379,000 cubic meters (495,000 cubic yards) in the 200 Area; and 159,000 cubic meters (208,000 cubic yards) in the 300 Area. A commercial low-level radioactive waste disposal facility, operated by US Ecology, is located southeast of the 200 East Area on land leased from Washington State.
(DOE/RL-98-48, Vol. II)

ENVIRONMENTAL LEGACY OF THE COLD WAR

Like most industrial and manufacturing operations, the nuclear-weapons complex has generated waste, pollution, and contamination. However, many problems posed by its operations are unlike

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those associated with any other industry. They include unique radiation hazards, unprecedented volumes of contaminated water and soil, and a vast number of contaminated structures ranging from reactors, to chemical plants for the extraction of nuclear materials, to evaporation ponds.

Early in the race to unleash the power of the atom, scientists involved with the weapons complex raised serious questions about its waste-management practices. Shortly after the Atomic Energy Commission was established, its 12-member Safety and Industrial Health Advisory Board reported that the "disposal of contaminated waste in present quantities and by present methods ... if continued for decades, presents the gravest of problems." The imperatives of the nuclear-arms race, however, demanded that weapons production and testing be given the first priority, rather than waste management and the control of environmental contamination.

(USDOE Historical Document)

DATABASES AND RECORDS MANAGEMENT

The Action Plan that supports the TPA requires that Ecology and EPA have access to all data that is relevant to work performed, or to be performed, under the Agreement. Further, the Action Plan specifies two additional requirements: 1) that EPA, Ecology and their respective contractor staffs have access to all the information electronically [Administrative Record]; and 2) that the databases [Environmental Databases] are accessible to, and used by, all personnel doing TPA-related work.

Hanford has several Environmental Databases to document and track the progress of Site cleanup: the Hanford Environmental Information System (HEIS), the Hanford Well Information Data System (HWIS), the Waste Information Data System (WIDS), and the Hanford Geographic Information System (HGIS). HEIS contains the date, time, location, and results from samples taken during activities such as field investigations and groundwater monitoring. HWIS contains the details of the wells and boreholes on the Site. WIDS tracks the waste sites – from discovery through cleanup. Each of the databases is supported by several applications for entering or retrieving information. HGIS keeps track of the locations for waste (WIDS) sites, wells and boreholes, and other sampling site locations.

Of the applications used to extract data from the Environmental Databases, the Hanford Map Portal (QMAP) is the newest, and perhaps the most efficient. QMAP combines the HGIS spatial information with the information from the other databases, allowing users to browse to, or query, the waste site or well of interest. A query of a waste site or well engages QMAP to find the object. The user may access the appropriate database.

In addition to managing data as with the Environmental Databases, records must also be protected and preserved. In addition to the document control system (Hanford Document Control System), the Record Management Information System¹ (RMIS) is the repository for many of the working copies of records; many records have been "retired" to the "Records Holding Area" (RHA). The Administrative Record (AR) is the body of documents and information considered or relied on to arrive at a final decision for remedial action or management of hazardous waste.

¹ RMIS applies only to the Project Hanford Management Contract (PHMC).

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An AR is established for each operable unit (OU); treatment, storage, or disposal unit (TSD); or expedited response action (ERA) group. The AR contains all documents having information considered in arriving at a record of decision or permit. In addition to the AR, a Public Information Repository (PIR) was established. The PIR provides for the public's access to information on Hanford cleanup activities and issues. The PIR was established by the Community Relations Plan of the TPA to ensure meaningful public participation.

All Hanford contractors are required to submit records identified as TPA-related documents to the AR for retention and public access, while only the Project Hanford Management Contract (PHMC) contractor or subcontractors submit records to RMIS. Thus, other contractors at Hanford would have their own document management systems and the retention of those documents would be covered by specific contract requirements. This way of doing business will change with the next generation of contracts at Hanford. The draft request for proposal of the Mission Support Contract requires that the contractor operate and maintain the new document management system described below.

A new system was introduced in 2004 for holding both working and record copies of documents, the Integrated Document Management System (IDMS). In March 2004, LM issued guidance on maintaining information as sites are cleaned up and transitioned to long-term stewardship, *Information and Records Management Transition Guidance*. This document focuses on LM's goal to preserve and protect legacy records and information. This guidance document establishes a framework for the transfer of records-management responsibilities for sites transferring to LM. It describes the requirements, responsibilities, and procedures for the efficient and cost-effective transfer of custody, ownership, and management of records and other information products.

The Executive Summary of that document states that, "The DOE Office of the Chief Information Officer (OCIO) has a central role in DOE records management by providing guidance, expertise, and coordination to all DOE offices and organizations and coordination with the National Archives and Records Administration (NARA)." The Executive Summary goes on stipulating that, "The DOE OCIO has a central role in DOE records management by providing guidance, expertise, and coordination to all DOE offices and organizations and coordination with the National Archives and Records Administration (NARA)." Thus LM's reference point is guidance from NARA. The guidance from NARA concerning the management of electronic records is the same guidance that is used in the design and implementation of IDMS.

The Hanford Environmental Databases

To meet the Action Plan requirement for electronic databases, DOE and its contractors have established the "Hanford Environmental Information Databases," which consist of four databases and several supporting applications.

DATABASES

- Hanford Environmental Information System (HEIS)
- Hanford Well Information System (HWIS)
- Waste Information Data System (WIDS)
- Hanford Geographic Information System (HGIS)

APPLICATIONS

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- Sample Data Tracking (SDT) System
- Well Maintenance Application (WMA)
- Well Survey Application (WSA)
- Web site access to HEIS and HWIS databases
- WIDS Application
- Hanford Virtual Library (VL)
- Hanford Geospatial Map Portal (QMAP)

The databases are required; the applications make the databases efficient, effective, and in some cases, easy to use.

HEIS is a consolidated set of automated resources that manage data collected during environmental monitoring and restoration. HEIS includes an integrated Oracle database that provides consistent, historical and current information for groundwater, soil, biota, air monitoring, surface water (including Columbia River and seep samples), soil gas, and miscellaneous material samples and their analytical results.

HEIS is a well-organized database that contains all chemical monitoring data since the 1950s. Chemicals monitored at the Hanford Site cover a wide spectrum of individual substances, matrices, and complex mixtures, including hazardous organic compounds, metals, and radionuclides. More than 600 chemicals are listed in the HEIS database, which contains a total of about 2.5 million chemical records for 900 water quality-monitoring wells.

HWIS documents information about wells and manages the information – from drilling to decommissioning. The WMA is the data-entry interface to the database. Information from HWIS and scanned well documentation can be retrieved through a web interface.

The WIDS database provides a traceable source of information about waste sites and other sites of environmental interest at Hanford. The system tracks investigation, remediation, and closure-action activities under the TPA.

HGIS is the geospatial platform to manage, update, analyze, and display spatial-related environmental data. The HGIS contains detailed, accurate maps of the Site and its main features, such as buildings, roads, aboveground and underground services, structures, piping, topography, geology, wells, and rivers and ponds.

SDT System electronically integrates steps of the Sample and Data Management Process. SDT is used to prepare Sample Authorization Forms (SAFs) and Chain-of-Custody Forms, as well as Sample Container Labels. The program automates tracking the progress of samples through the Sample and Data Management Process. SDT is the front-end application for the HEIS database.

The VL is Hanford's first graphic user interface (GUI) for accessing environmental sample information from HEIS. The VL, updated nightly from the HEIS database, provides tools that help scientists and engineers access and analyze the environmental information. The VL requires training and frequent use for the user to be proficient.

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EnviroDataAccess (EDA) technology is one of the recent advanced technologies developed under the DOE's Small Business Innovative Research (SBIR) program by Consultants For Environmental System Technologies Inc. Most of the chemical data are in tabular form. DOE site contractors, regulators, and other data users spend hours to repeatedly extract partial information to understand and use the available information. EDA technology eliminates the need for the individual HEIS user to extract and plot data.

QMAP acts as a centralized geospatial data portal (Figure 2) that can be used by people with minimal skills in geographic information system (GIS) to obtain environmental and other pertinent data. A data portal allows technology common to different types of geospatial applications to be implemented once and shared across applications. QMAP includes communication and feedback loops that allow users to communicate with data and profile stewards about geospatial information. In addition, it links documents, drawings, weather and other reference information to map data. Web-map applications produced for QMAP are created in a consistent form that complies with data standards. In addition, a spatial-data clearinghouse, the Hanford Geospatial Clearinghouse, has been integrated into the QMAP portal. In short, QMAP links to each of the environmental databases and gives users a common GUI to both view the location of the database objects and retrieve the information about those objects from the appropriate databases.

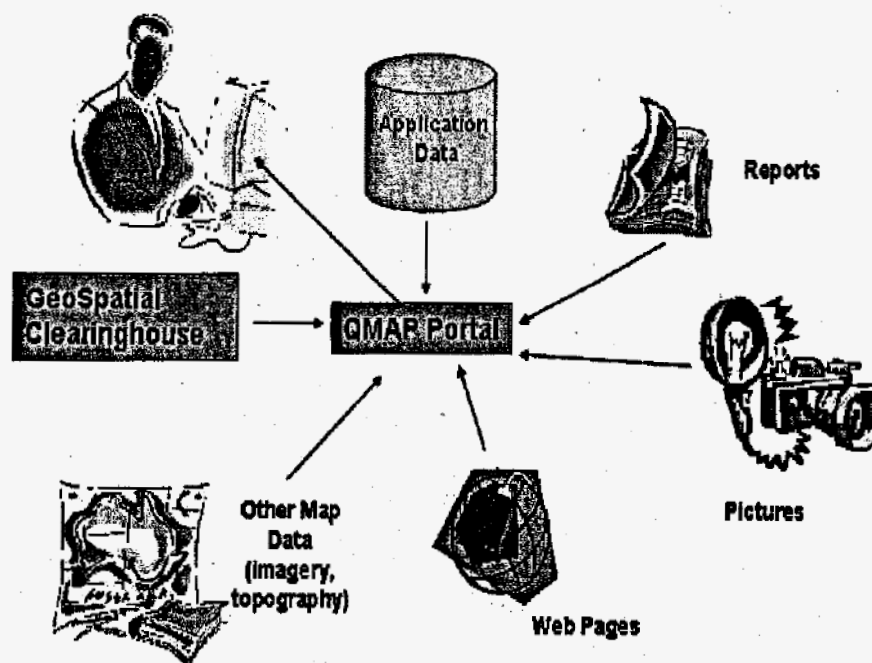


Fig. 2. QMAP integrates data for easy and effective access to both geospatial and tabular data.

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For example, Figure 3 illustrates the location of a facility on a map that has the location of the WIDS site included. To access a list of WIDS sites contained in the facility, a "geo-search" of the facility may be performed. To see a list of WIDS sites in and around the facility, one may perform a buffer search stipulating a particular distance away from the facility. From that list, summary reports and other information related to the WIDS sites may be listed and downloaded to suit the user's needs.

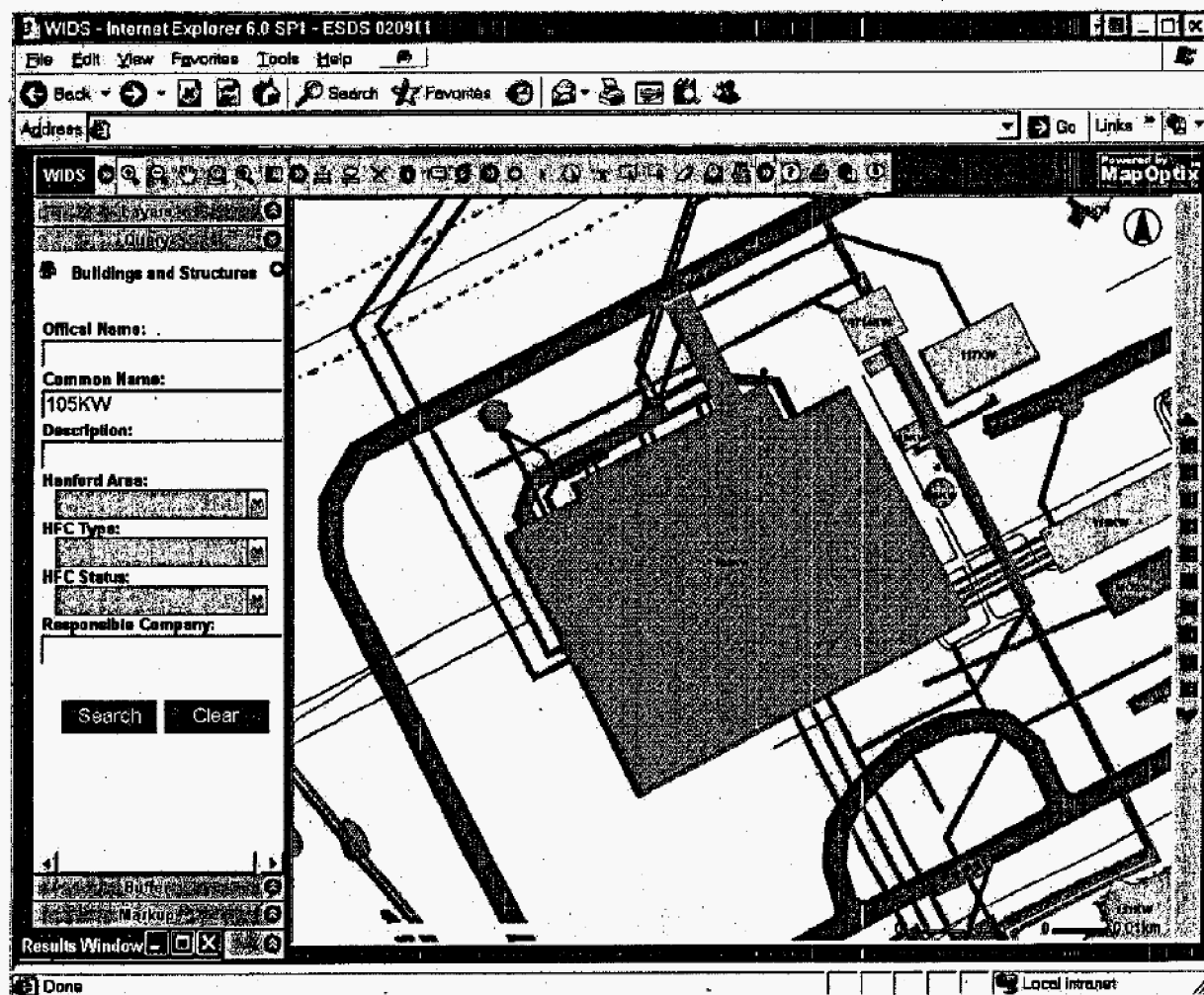


Fig. 3. Users may query QMAP for various data including the location of a facility.

In Figure 4, the results for a query against a well ID produces a map of the selected well surrounded by its neighbors; the query result window (bottom of the graphic) is visible. If the well name (199-B2-12) is selected (clicked on) in the query result window, information about that well may be obtained from HWIS – history, survey, as-built summary, maintenance records, and construction information. If the well ID (A4550) is selected, information about the environmental samples taken may be obtained from HEIS. The information from HEIS may be accessed by entering either the SAF or the sample numbers, or a range of sample dates. Usually, media for the sample from a well would be soil or groundwater, and the search may be done for

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either specific or all constituents. At the far end of the query results window, the link marked with "INSP" allows access to the inspection reports for the well specified.

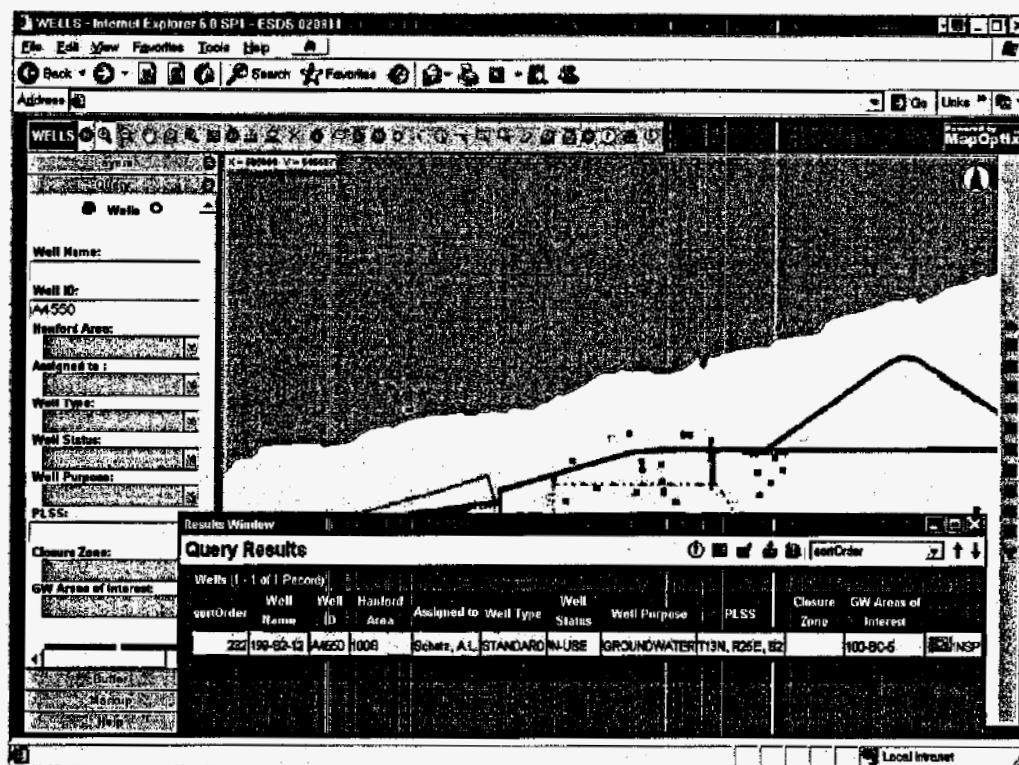


Fig. 4. QMAP provides specific information for wells, including location and inspection reports.

QMAP is the next step at Hanford in making access to environmental information available for the authorized personnel. QMAP generally does not require the training and experience required for the VL, yet it provides much of the HEIS data available through the VL, as well as data from the other databases. Best of all, by the time you read this paper, the VL and QMAP will be integrated to provide even easier and more powerful access to environmental data.

Records Management at Hanford

After 60-plus years of only storing official records in hardcopy format, Hanford has begun storing DOE and contractor records electronically. In May 2004, DOE approved the use of Open Text Livelink® and its Records-Management module, part of IDMS, as a repository for electronic records.

Official records retained in electronic format may include documents developed by office automation applications, including word processing and e-mail; scanned images of hardcopy documents; and records derived from data systems. Regardless of the source, each record series is reviewed and approved for electronic storage and disposition. The IDMS provides electronic document management, knowledge management, workflow capability, and a certified records repository.

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IDMS is the cornerstone of the records-information management (RIM) strategy to increase the value and accessibility of information to the Hanford Site using both technology and functional processes to provide total electronic life-cycle information management - from creation and approval through use and archiving. Starting in 2006, IDMS is being used in lieu of the RHA for achieving record copies of documents.

Many historical documents that may assist in managing the cleanup and remediation of the Hanford Site in the future, as well as legacy management, reside in the Hanford Technical Library and other locations in either hard-copy or microfiche form. To be complete in our stewardship responsibilities, these documents should be scanned and added to systems like IDMS that will be used to achieve the Hanford record for future generations.

CONCLUSION

Processes and procedures need to be in place to assure that both the records and the data required by Legacy Management are assembled and maintained long before a site will be turned over to Legacy Management. The guideline used to establish programs for databases and records must be compatible with the requirements of the end users.

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